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# Impacts of Compost Application on Highway Construction Sites in Iowa

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**Abstract**

Runoff, interrill erosion, and growth of erosion control vegetation and weeds were measured on conventionally treated portions (control) of newly constructed roadway embankments, and on areas pretreated with topsoil or one of three different types of composted organics. Runoff rates and interrill erosion rates from the control and topsoil-treated plots were highest. Runoff rates from the three compost media (biosolids, yard waste, bio-industrial waste) used were statistically lower than the control. Runoff from plots treated with yard waste and bio-industrial waste composts were statistically lower from plots treated with topsoil. Interrill erosion rates from topsoil-treated plots were significantly higher than from compost-treated or control plots. The amounts of planted cover crop grown on all treatments were statistically indistinguishable. Mean values for weed growth on the control and topsoil plots are statistically indistinguishable, and all compost treatments except biosolids-10 cm and yard waste-5 cm produced significantly lower weed growth than either the topsoil or control plots.

**Keywords**

soil erosion, runoff, highways, roads, construction

**Disciplines**

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# Impacts of Compost Application on Highway Construction Sites in Iowa

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**Keywords.** soil erosion, runoff, highways, roads, construction

## Introduction

Responding to public concerns expressed in 1989 regarding the groundwater pollution potential and rapidly diminishing capacity of the State's landfills, the Iowa legislature mandated a 50% reduction (by year 2000) in the amount of solid waste buried in landfills, and banned land filling of all yard and garden wastes. The new solid waste policy stimulated rapid growth in the organics composting industry in Iowa during the 1990's. Today, nearly 80 composting facilities divert and process 320,000 metric tons of yard waste, biosolids, and industrial organics from Iowa landfills annually. While successfully reducing pressure on landfills, the rapid increase in composting operations also has created a need for new markets that can utilize large amounts of composted materials.

New road construction and roadway maintenance projects in Iowa offer a potentially large market for composted organics. Iowa's 180,000 km network of city, county, and state roadways require constant repair and expansion, and roadway construction projects also demand significant attention to erosion and runoff control. Rapid establishment of cover crops are one of the most widely used methods of control. During fiscal year 2000 alone, the Iowa Department of Transportation (IDOT) let bids to seed and fertilize more than 2600 acres of land adjacent to 151 miles of state-sponsored road construction projects. Since many city and county road projects do not utilize the IDOT bidding process, statewide demand for roadside seeding and fertilization is even larger than suggested by IDOT project statistics.

While rapid establishment of vegetation is a top priority following completion of new roadway construction projects, the compacted subsoils that form roadway embankments often lack the infiltration capacity and organic matter content needed for rapid and vigorous growth of cover crops. Although it is generally acknowledged that application of composted organics to erosion-prone slopes has potential to improve organic matter content and reduce erosion, few studies have been conducted to quantify these benefits. To support Iowa's solid waste management goals and simultaneously determine if compost applications are sufficiently beneficial to justify their cost to road construction projects, the Iowa Department of Natural Resources and Iowa Department of Transportation funded a two-year study by researchers at Iowa State University.

## Summary of Recent Literature

Recognizing that soil loss rates from construction sites are typically 10 – 20 times those from agricultural lands (USEPA, 2000), control of storm water, erosion, and sediment at construction sites was mandated by 1987 amendments to the federal Clean Water Act (CWA). EPA Phase I Rules, promulgated in 1990, require construction permits and pollution prevention plans for construction sites disturbing more than five acres (USEPA, 2000). Phase II rules, which became final in 1999 and will take effect in 2003, extend the requirements of the storm water program to smaller construction sites of one to five acres in size (USEPA, 2001).

Storm water and erosion regulations specific to highway construction sites include the Intermodal Efficiency Act of 1991, which requires the Federal Highway Administration (FHWA) to develop erosion control guidelines to be used by states whenever road construction projects are supported by federal aid (Federal Highway Administration, 1997). The "Transportation Equity Act for the 21$^{st}$ Century", signed into law in June of 1998, continues several water-related provisions of the Intermodal Efficiency Act and adds new programs addressing storm water treatment systems, BMP's, and wetland restoration projects (US Environmental Protection Agency, 1998)

Current literature suggests that many states have experimented informally with using compost to reduce erosion and water quality problems, but there are relatively few reports of quantitative measurements of the impacts of compost on erosion or water quality. A survey of state departments of transportation (DOT's) by Mitchell (1997), indicated that 19 state DOT's had developed specifications for compost use. Thirty-four DOT's reported experimental or routine use of compost on roadsides for purposes such as: improved grass, tree, and wildflower production; erosion control; reduced moisture loss; filter berms; and bioremediation of soils contaminated by petroleum compounds. Highway projects using composted organics specifically to control soil erosion were reported in Maine, California, Washington, Florida, Oregon, and Arizona.

A review of literature on pollution caused by highway runoff and highway construction by Barrett et al. (1995) notes that the most commonly-cited water quality impacts of road building are increased turbidity and suspended solids concentrations in construction site runoff during and immediately following completion of construction. Barrett's review also indicates that most highway erosion research conducted in the U.S. since the 1960's focused on erosion reduction using synthetic slope covers, natural fiber mats, mulches, sediment barriers, check dams, and sedimentation ponds. No specific references to utilization of composted organics for erosion control were noted.

Reports of projects specific to the use of compost (or wood waste) on road construction projects include a project sponsored by the Federal Highway Administration (FHWA) and the US Environmental Protection Agency (EPA) which reported superior vegetative growth on compost amended soils when compared to that produced on plots treated with hydromulch and fertilizer (USEPA, 1997).

The Texas Natural Resources Conservation Commission and the Texas Department of Transportation have cooperated on five road construction demonstration projects using composted dairy or cattle manure. Project coordinators report that three-inch layer of compost substantially improved vegetation growth and reduced soil erosion compared with untreated roadway embankments (Block, 2000, USEPA, 2000).

A seven-month project by the city of Portland, Oregon, applied 7.6 cm layers of three different yard debris composts to a road construction site, mobile home development, and a new home site. Site slopes ranged from 0 to 35 degrees. Erosion was evaluated visually following natural rainfall events and via monthly site photographs. Project staff reported evidence of reduced erosion and improved water quality, with some cracking or rilling of the compost layer on steeper slopes (Portland Solid Waste Department, 1994). Ettlin and Stewart (1993) reported that the use of yard debris compost is an effective alternative to current erosion control measures on slopes up to 42%. A more quantitative follow-up study planned for 2001 by the Oregon Department of Environmental Quality and City of Portland will compare the quantity and quality of natural runoff from an urban construction site amended with compost, to that from a construction site receiving conventional storm water control practices (Kunz, 2001).

Quantitative erosion control studies using compost or organic mulches with textures similar to some composts include work by Demars, Long, and Ives (2000) who applied 2 – 8 cm blankets of wood waste to 14 test cells on a highway embankment with a 26 degree slope. Total rainfall, rainfall intensity, test cell runoff, and suspended solids concentrations, were recorded from 11 natural storm events. Plots treated with wood waste blankets substantially reduced runoff, particularly for storms of 1 cm or less, and bare plots exhibited as much as 50 times more sediment than those treated with the wood mulch.

Alexander (2001) reports that the depth of compost application varies depending on site characteristics such as slope, existing soil conditions, and the type of compost. Stewart and

Pacific (1993) suggested blanket applications of 7.5 cm and Michaud (1995) suggested blanket applications of 10 cm. Michaud (1995) further explained that applications at 10 cm will effectively control erosion on slopes up to 45% for 1 to 3 years.

Storey et al. (1996), compared vegetative growth and erosion on compost-amended plots and plots treated with shredded wood and two types of synthetic chemical tackifiers. Treatments were applied to two general soil types (sand and clay), simulated rainfall was applied at three different intensities, and sediment losses were compared with erosion standards set by the state of Texas. Compost amended plots on clay soils were shown to be as effective as the other treatments. On sandy soils, erosion on compost-treated plots was less than half that recorded for the other treatments.

A two-year study completed in 1998 by the Connecticut Departments of Environmental Protection and Transportation evaluated erosion on experimental plots constructed on a new roadway embankment with 2:1 slopes. Eight plots were treated with 1.5– or 3–inch depths of composted yard waste, wood mulch, and straw. Erosion on the untreated control plot was reported to be more than 10 times that produced on any of the mulched plots. Thickness of the mulch layer did not appear to significantly affect the observed erosion rates (Block, 2000).

Agassi et al. (1998) studied the effects on storm runoff of surface-applied municipal solid waste compost. One- to three-centimeter thick layers of compost were surface applied to identically prepared loess soils placed in small boxes and subjected to six simulated rainfalls totaling 260 mm. Approximately 85% of applied rainfall infiltrated into compost-treated plots while 52% or less was absorbed by control plots.

## Project Objectives

Excess erosion on road construction projects results in expensive regrading and reseeding, and during seasons with severe storms this can happen repeatedly before permanent cover is established. While there is considerable qualitative evidence that application of composted organics to roadsides has potential to reduce erosion and improve water quality, the amount of quantitative data currently available are insufficient to determine whether the environmental benefits justify the added cost of compost applications. A better understanding of the relationships between rainfall intensity, compost type and rate of application, erosion, and runoff quality can thus provide transportation officials and other land managers with an important tool for environmental and economic analysis.

To investigate the impacts of compost on roadside erosion control, Iowa State University (ISU) researchers and representatives of the Iowa Department of Natural Resources and the Iowa Department of Transportation established the following project objectives:

- Assess the impacts of compost use on establishment and growth of roadside vegetation intended to reduce runoff and soil erosion;
- Measure and compare runoff and interrill erosion from compost-treated, topsoil-treated, and untreated roadway embankments using rainfall simulation and established erosion measurement techniques;
- Measure and compare rill erosion on compost-treated, topsoil-treated, and untreated roadway embankments using rainfall simulation and established erosion measurement techniques;
- Determine appropriate soil erodibility values for compost-treated slopes that can be used in the USDA Water Erosion Prediction Project (WEPP) computer model to predict potential erosion control benefits of using compost on road construction projects.

- Develop and maintain a project website to inform the citizens of Iowa about the purpose, methods, and results of the project.

This paper presents first-year data and findings (data from 3 additional replications are being collected during the summer of 2001) relevant to the first two objectives (assessment of interrill erosion and vegetative growth) listed above. Analysis of rill erosion data and calculation of soil erodibility factors are under way and will be reported at a later date. Interested readers can view the project website at http://compost.ae.iastate.edu.

## Materials and Methods

### *Compost Selection*

Compost is not a homogeneous commodity. A diversity of feedstocks, processing technologies, and product screening techniques generate a wide range of products with varying characteristics. Some characteristics, such as particle size and nutrient availability, may significantly affect the physical processes of erosion and the biological processes of plant growth. Composts selected for inclusion in this study are derived from: sewage biosolids and yard waste processed by the city of Davenport, IA; yard waste processed by the Metro Waste Authority of Des Moines, IA; and a mix of source-separated bio-industrial byproducts (paper mill and grain processing sludge) and yard waste received by the Bluestem Solid Waste Agency in Cedar Rapids, IA. The Iowa Department of Natural Resources selected these composts because they are considered to be representative of three common types of organics that are readily available in large quantity throughout the state.

### *Site Selection*

Iowa Department of Transportation staff and ISU project investigators jointly selected a re-graded interstate highway interchange located approximately 16 km north of Ames, Iowa as the research site. The site includes two south-facing compacted earthen embankments that were reconstructed in late 1999 to permit repositioning of safety railings further from the traffic lanes. The embankment slope is approximately 3 to 1, the maximum typically allowed by state and federal highway construction standards.

### *Methods*

#### Experimental Plots & Treatments

Prior to establishing the experimental plots, the roadway embankment was prepared by an IDOT site contractor according to IDOT specifications. Site preparation consisted of disking parallel to the slope contour to roughen the compacted soil and destroy unwanted weed growth.

Experimental plots measuring 120 cm by 180 cm were subjected to one of 8 treatments. Six of the treatments consisted of either 5 cm or 10 cm thick blankets of one of the three composts. The remaining two treatments include a 15 cm blanket of imported topsoil, or no treatment (control). Both the topsoil and control treatments are typical practices specified by IDOT and are included in the experimental design to provide a benchmark against which to assess the erosion control and vegetative growth performance of the compost treatments.

Each of the plots was replicated 6 times during the first year of the project. Three of the replications were tested immediately following plot construction to simulate runoff and erosion from an un-vegetated construction site. The remaining three replications were fertilized and planted with a mixture of oats, rye, timothy, and clover according to IDOT specifications, and were subjected to testing approximately 6 weeks after vegetation emerged. During the second year of the project, all treatments will be replicated at a different location on the same highway interchange so that data from six vegetated and six un-vegetated replications will be obtained for each treatment.

## Runoff and Erosion Assessment

Runoff and interrill erosion were evaluated by applying simulated rainfall to 50 cm by 75 cm areas located in the center of each of the experimental plots. The erosion and runoff measurement areas are bordered on the up-gradient edge and sides with 20 cm wide galvanized steel strips driven approximately 5 cm into the ground. Runoff originating within the steel borders is captured by a V-shaped galvanized steel tray positioned along the down-gradient edge of each plot, and is diverted into a 1-L plastic sample container positioned outside the rainfall pattern (Fig.1).

Rainfall was applied to experimental plots using an 8-m long single-sweep Norton Rainfall Simulator of the type developed for soil erosion studies and used worldwide by the USDA National Soil Erosion Laboratory located at Purdue University.

Figure 1. Rainfall simulator and interrill plots (left), and interrill erosion sampling in progress.

Runoff and erosion measurements made during this study followed procedures similar to those used by USDA researchers at the National Soil Erosion Laboratory during development of the Water Erosion Prediction Project (WEPP) and as described in detail by Liebenow et al. (1990) and King et al. (1995). Typically, soil test plots are subjected to simulated rainfall at a fixed rate of 63 mm/hr for approximately one hour or until runoff is initiated. As soon as runoff from a plot is observed, sampling is begun and 10 –12 samples are collected at 5- to 7-minute intervals during the first hour of runoff. Start and finish times for each sample are recorded so that runoff rates can be calculated. Samples are weighed, dried, and reweighed in the laboratory to determine the total mass of sediment and water captured during each runoff-sampling interval. Data from rain gages positioned near each experimental plot are used to determine the total amount and rate of rainfall applied, and plot infiltration is calculated as the difference between the applied rainfall and the amount of runoff collected.

An important difference between the USDA study procedures typically used on natural soils, and those used on the compost treated plots in this particular study, is that the compost produced relatively little runoff at the standard rainfall intensity of 63 mm/hr. In order to initiate runoff from the compost-treated plots within a reasonable length of time, rainfall intensities were increased to 80 –110 mm/hr.

### Cover Crop Assessment

First year comparisons of the cover crop produced by the different treatments were accomplished by randomly sampling each of the vegetated plots (outside of the eroded areas subjected to simulated rainfall) at the end of the growing season. A sampling ring of known area was tossed onto the vegetated areas of each plot to randomly select the sample area, and then all vegetation inside the ring was hand clipped at ground level and stored in refrigerated bags until the samples could be dried and weighed. At the time of weighing, each of the samples was visually examined and separated into two sub-samples containing planted species (oats, rye, timothy, and clover) and weeds.

## Results

### *Rainfall Intensity*

Since both runoff and erosion are typically affected by rainfall intensity, it is important to determine if all treatments received rainfall of equal intensity during collection of runoff and erosion data. Despite the use of rainfall simulation equipment, shifts in wind velocity and minor day-to-day variations in pump and rainfall simulator control settings can cause differences in the rainfall intensities applied to experimental plots.

Mean rainfall intensities received by each treatment during the first year of the study are summarized in table 1. Analysis of variance (ANOVA) indicates no significant differences ($p=0.7552$) in rainfall intensity received by the various treatments, allowing subsequent analyses of runoff and interrill erosion data to be carried out without making adjustments for rainfall variability.

Table 1. Mean rainfall intensity for 6 compost treatments, control, and topsoil.

| Treatment | Replications | Mean Rainfall Intensity (mm/hr) | Standard Deviation |
|---|---|---|---|
| Biosolids – 5 cm | 6 | 90.61[a] | 22.28 |
| Biosolids – 10 cm | 6 | 102.44[a] | 19.22 |
| Yard waste – 5 cm | 6 | 95.05[a] | 16.84 |
| Yard waste -- 10 cm | 6 | 89.02[a] | 24.94 |
| Bio-industrial waste – 5 cm | 6 | 84.72[a] | 23.61 |
| Bio-industrial waste -- 10 cm | 6 | 100.18[a] | 24.39 |
| Control | 12 | 91.90[a] | 20.97 |
| Topsoil | 12 | 93.53[a] | 32.33 |

Means with different letter designations are significantly different ($p<0.05$).

### *Runoff Rate*

As shown in Figure 2, control and topsoil treatments exhibited the highest mean runoff rates, while mean runoff rates from the bio-industrial and yard waste compost treatments were the lowest. Several statistical tests were conducted to determine whether the treatment differences are statistically significant, and to identify which factors affect runoff the most.

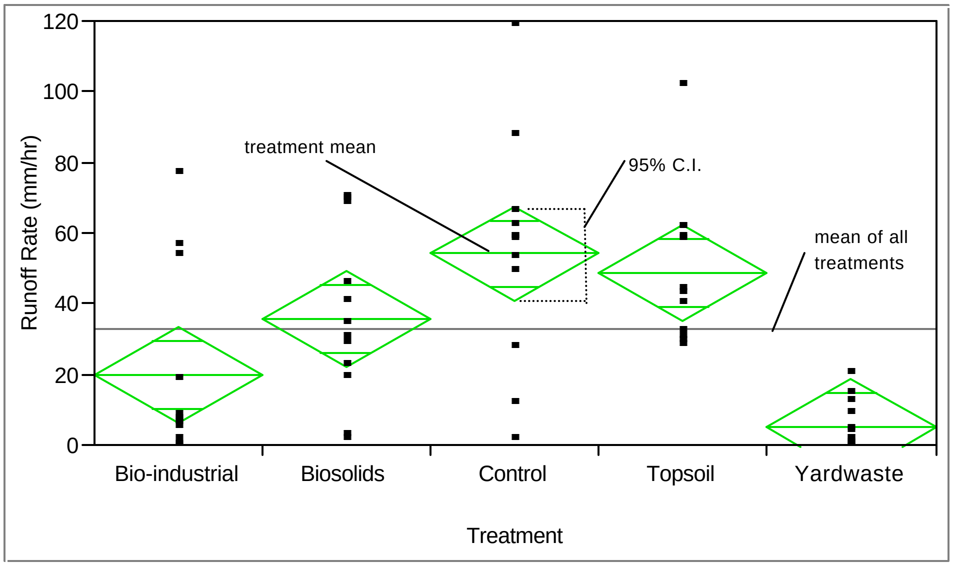


Figure 2. First year mean runoff rates for compost-treated, control, and topsoil-treated plots.

Analysis of variances confirms statistically significant ($p<0.0001$) differences in runoff between some treatments. Although vegetation status is a factor that might reasonably be expected to impact runoff rate, ANOVA results show that the interaction of vegetation with the plot treatments was not significant ($p=0.7650$). This means that vegetation effects are essentially the same for each treatment, and that data from vegetated and un-vegetated plots can be combined for the purposes of subsequent statistical analyses.

Statistical contrasts were performed to answer questions regarding the effects on runoff caused by compost depth and type of compost. The first contrast was performed to determine whether compost application depth (5 cm or 10 cm) is a significant factor in the runoff rate (regardless of compost type). Mean runoff from all 5 cm compost treatments was compared with mean runoff from 10 cm compost treatments and found to be significantly different ($p=0.0494$).

Since compost depth is a significant factor in runoff, it is necessary to test whether depth has similar effect on runoff from each type of compost. If the runoff effects of compost depth are similar for all composts, then depth can be disregarded when comparing different composts to one another or to the control and topsoil treatments. This, in fact, was the case as the interaction between depth and compost type was not statistically significant ($p=0.2629$). Based on this finding, runoff data for the two composts depths were combined for the purpose of subsequent analyses.

Mean runoff rates for all treatment media (aggregating vegetation status and depth, since neither factor is significant), are shown in table 2. Biosolids had the highest rate of runoff of all the composts, and was significantly higher ($p=0.0011$) than yard waste, which had the lowest runoff. Runoff from the bio-industrial compost fell between that from the other two composts and was not significantly different from either.

Mean runoff from the control and topsoil treatments was not significantly different. All compost-treated plots produced significantly lower runoff than the control plots. Both the yard waste and bio-industrial composts produced significantly lower runoff than the topsoil treatment, but mean runoff from the soil-like biosolids compost did not differ significantly ($p=0.1409$) from the topsoil treatments.

Table 2. First year runoff rates for compost, control, and topsoil treatments (aggregated data for 2 vegetation conditions and 2 compost depths).

| Media | Replications | Mean Runoff Rate (mm/hr) | Standard Deviation |
|---|---|---|---|
| Biosolids | 12 | 36.00[a,d] | 24.00 |
| Yard waste | 12 | 5.50[b] | 6.80 |
| Bio-industrial waste | 12 | 19.90[a,b] | 26.50 |
| Control | 12 | 54.40[c] | 31.30 |
| Topsoil | 12 | 48.90[c,d] | 21.00 |

Means with different letter designations are significantly different ($p<0.05$).

### *Interrill Erosion Rate*

The general trends for mean interrill erosion rates are similar to those for runoff (Figure 3). Again, the control and topsoil treatments exhibited the highest mean values, and the compost treatments are lower.

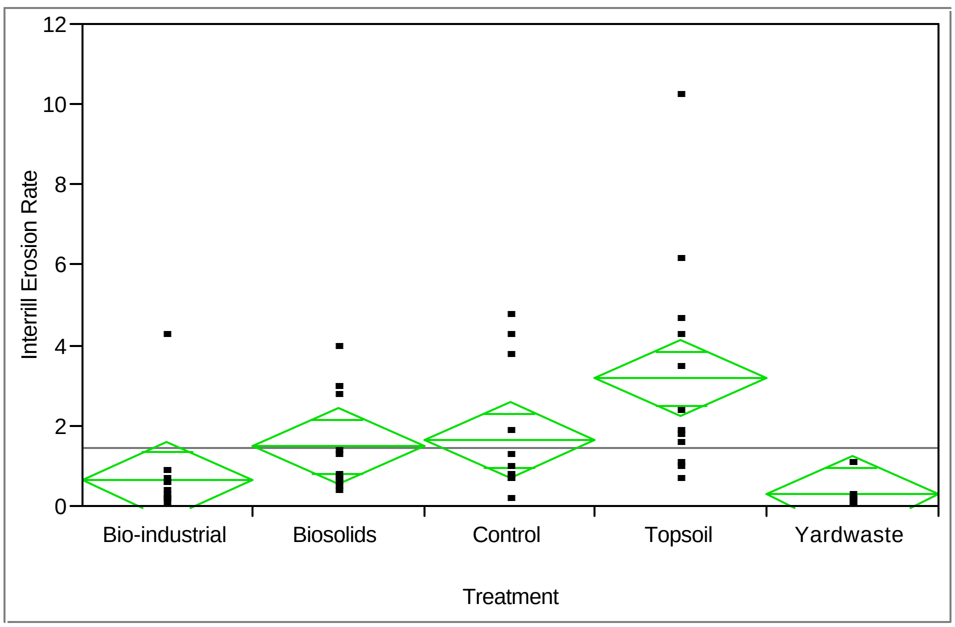


Figure 3. First year mean interrill erosion rates ($mg/m^2/sec$) for compost-treated, control, and topsoil-treated plots.

The ANOVA of mean interrill erosion rates for all treatments indicates highly significant differences among some treatments ($p=0.0002$). As with the runoff data, however, the interaction between vegetation status and treatments was not significant ($p=0.3777$), indicating that the presence or absence of vegetation has equivalent affects on interrill erosion for all treatments. As a result, data from the vegetated and un-vegetated plots were combined for the purposes of subsequent statistical analyses.

As before, statistical contrasts were performed to answer questions regarding the specific effects of depth and type of compost. No significant differences ($p=0.7212$) in mean interrill erosion rate were noted between the 5- and 10-cm compost depths, making it possible to combine the data from both depths for the purposes of subsequent statistical analyses.

Mean interrill erosion rates for all treatment media are presented in table 3.

Similar to the runoff data, biosolids compost had the highest mean interrill erosion of all the composts, and was significantly higher than yard waste, which had the lowest mean interrill erosion. Again, the mean value for the bio-industrial compost fell between those from the other two composts and was not significantly different from either.

Mean interrill erosion for topsoil is significantly higher than for the control or any of the compost treatments. Mean interrill erosion for the control treatment is significantly higher than for the yard waste compost (p=0.0127), but is not significantly different from erosion measured on the biosolids or bio-industrial plots.

Table 3. First year interrill erosion rates for compost, control, and topsoil, treatments (aggregated data for 2 vegetation conditions and 2 compost depths).

| Media | Replications | Mean Interrill Erosion Rate (mg/m$^2$/sec) | Standard Deviation |
|---|---|---|---|
| Biosolids | 12 | 1.50[a] | 1.25 |
| Yard waste | 12 | 0.27[b] | 0.38 |
| Bio-industrial waste | 12 | 0.68[a,b] | 1.14 |
| Control | 12 | 1.65[a] | 1.60 |
| Topsoil | 12 | 3.19[c] | 2.78 |

Means with different letter designations are significantly different (p<0.05).

### *Vegetative Growth*

#### Planted Species Biomass

Data from 3 end-of-season samples are shown in Figure 4. The mass of planted species (oats, rye, timothy, clover) produced on the biosolids compost was somewhat lower than for the other composts, but there were no statistically distinguishable differences between the dry mass of planted species produced by the various treatments (Table 4).

Table 4. First year mean dry mass of planted species considering media and depth (treatment).

| Treatment | Replications | Mean Mass of Planted Species (g) | Standard Deviation |
|---|---|---|---|
| Control | 3 | 49.55[a] | 14.48 |
| Topsoil | 3 | 31.30[a] | 13.53 |
| Biosolids - 5 cm | 3 | 30.56[a] | 18.12 |
| Biosolids - 10 cm | 3 | 33.72[a] | 5.81 |
| Yard waste - 5 cm | 3 | 40.95[a] | 14.68 |
| Yard waste - 10 cm | 3 | 53.93[a] | 4.45 |
| Bio-industrial waste - 5 cm | 3 | 52.70[a] | 7.87 |
| Bio-industrial waste – 10 cm | 3 | 49.89[a] | 23.33 |

Means with different letter designations are significantly different (p<0.05).

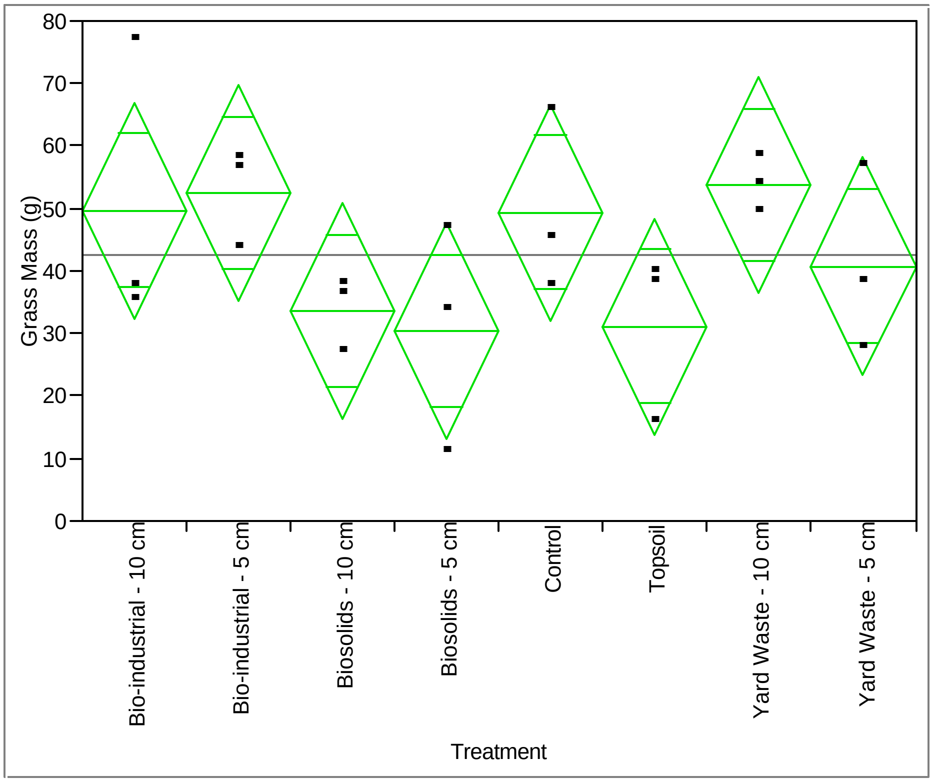


Figure 4. First year mass of planted species by treatment.

## Weed Biomass

In general, compost-treated plots produced noticeably less weed mass than the control and topsoil-treated plots as shown in figure 5. Analysis of variance verified significant differences (p= 0.0323) in the dry mass of weeds produced by some treatments. Tukey's pair wise comparisons shows that mean values for the control and topsoil plots are statistically indistinguishable, and that all compost treatments except biosolids-10 cm and yard waste-5 cm produced significantly lower weed growth than the topsoil or control plots. As shown in table 5, mean values for these two compost treatments are well below those for the control and topsoil treatments, and it is believed that additional biomass data from the second year of the project will substantiate a significant difference.

Table 5. First year mean dry weed mass considering media and depth (treatment).

| Treatment | Replications | Mean Weed Mass (g) | Standard Deviation |
|---|---|---|---|
| Control | 3 | 33.09[a] | 27.28 |
| Topsoil | 3 | 29.55[a] | 24.10 |
| Biosolids- 5 cm | 3 | 0.00[b] | 0.00 |
| Biosolids - 10 cm | 3 | 6.39[a] | 11.07 |
| Yard waste - 5 cm | 3 | 5.19[a] | 8.18 |
| Yard waste - 10 cm | 3 | 0.10[b] | 0.17 |
| Bio-industrial waste - 5 cm | 3 | 0.00[b] | 0.00 |
| Bio-industrial waste – 10 cm | 3 | 0.84[b] | 1.46 |

Means with different letter designations are significantly different (p<0.05).

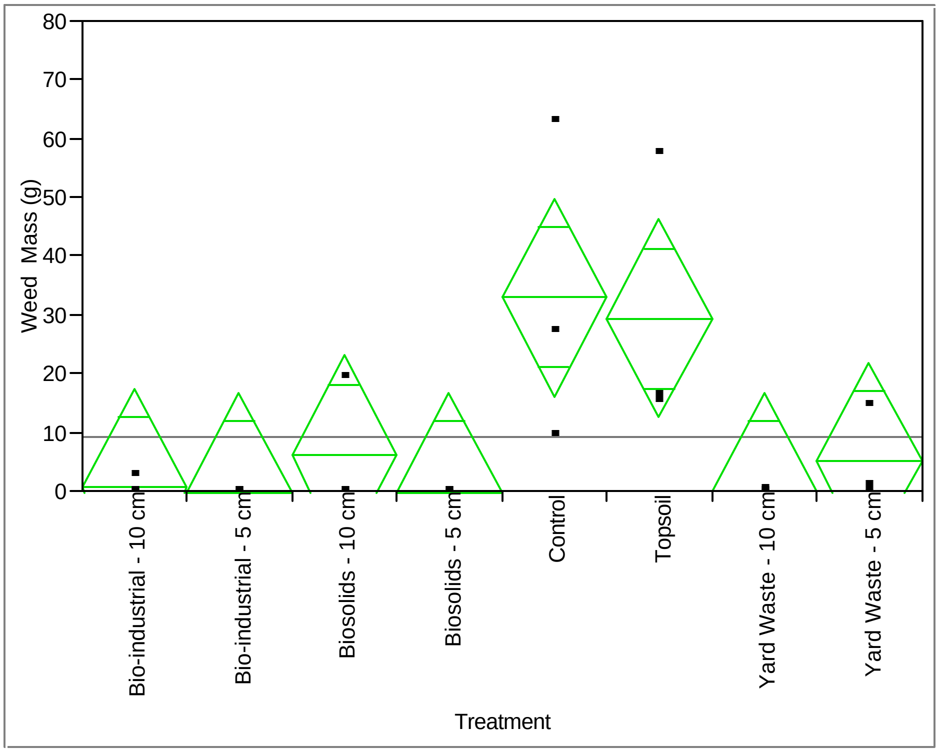


Figure 5. First year weed mass by treatment.

## Conclusions

Runoff rates from un-vegetated and vegetated plots did not differ significantly, but runoff rates from plots treated with 5 cm of compost are significantly lower than those treated with 10-cm thick layers of compost. The three compost media runoff rates are all significantly lower than the control. In addition, all three compost media runoff rates are lower than the topsoil, but only the yard waste and bio-industrial waste are significantly lower. Runoff from yard waste was the lowest of the three compost media, and was significantly lower than the biosolids runoff rate.

Mean interrill erosion rates for compost–treated plots are lower than for the control plots, but only the yard waste is significantly lower than the control. All compost-treated plots and the control plots displayed interrill erosion rates significantly lower than topsoil-treated plots. As with the runoff data, yard waste interrill erosion was lowest among the three composts, and is significantly lower than the biosolids interrill erosion rate.

Despite some obvious physical differences in texture, density, and organic matter content, the amounts of planted cover crop grown on all treatments were statistically indistinguishable. Mean values for weed growth on the control and topsoil plots are statistically indistinguishable, and all compost treatments except biosolids-10 cm and yard waste-5 cm produced significantly lower weed growth than either the topsoil or control plots. It is believed that the heat-treated compost materials contained substantially fewer viable weed seeds than the topsoil and control soil. As a result, the cover crop planted into the 5 and 10 cm compost blankets was able to emerge rapidly and establish a canopy before weed seedlings originating in the underlying soil could penetrate through the compost layer.

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